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--SILICA--

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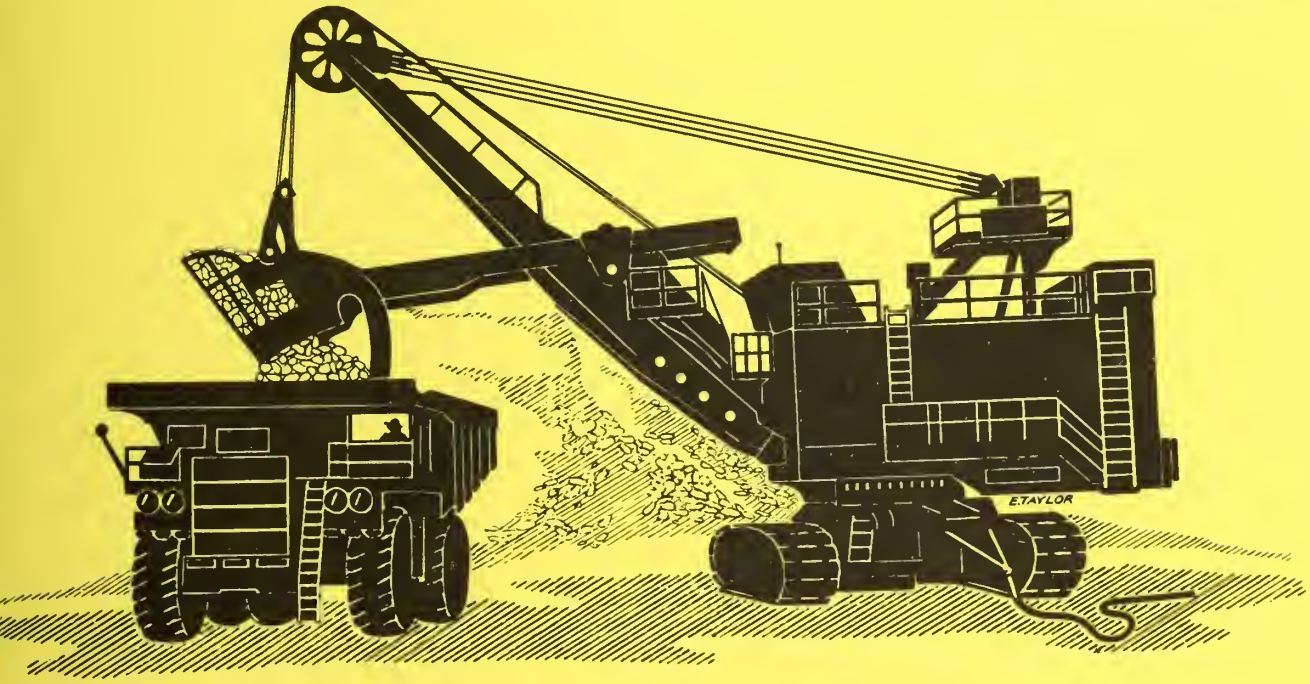

CALIFORNIA DEPARTMENT OF CONSERVATION
DIVISION OF MINES AND GEOLOGY

SPECIAL PUBLICATION 89

THE RESOURCES AGENCY
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SPECIAL PUBLICATION 89

MINERAL COMMODITY REPORT

--SILICA--

1985

By
MICHAEL A. SILVA

Part 1 from
the U.S. Bureau of Mines publication,
Mineral Commodity Summaries, 1984

CALIFORNIA DEPARTMENT OF CONSERVATION
DIVISION OF MINES AND GEOLOGY
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INTRODUCTION

This report on the availability and demand for silica in California, the United States, and the world is one in a series of Mineral Commodity Reports prepared by the Department of Conservation, Division of Mines and Geology (DMG) to describe commodities of significance to California and the nation.

This mineral commodity report was compiled by Michael A. Silva of the DMG geologic staff. Part I consists of United States and world-wide mineral statistic information and analysis adopted directly from the U.S. Bureau of Mines "Mineral Commodity Summaries, 1986". Part II discusses production of silica commodities in California. The U.S Bureau of Mines presents the earliest Government estimate of non-fuel mineral-industry data, including world resource data provided by the U.S. Geological Survey. Silica statistics are equivalent to industrial sand and gravel statistics, because only a small amount of hard-rock silica is mined in the United State, including California.

Silica is a general term used to describe siliceous earth materials used in a large variety of industrial applications. Silica raw materials include quartzose and feldspathic sands, gravels, conglomerates and sandstones, vein quartz, quartzite, quartz-bearing schist, and other high silica rocks. The uses of silica range from glassmaking to sand for sand traps in golf courses. Silica products must conform to rigid specifications and have a higher unit value than common construction materials. Approximately 80% of the silica mined in California is used in glassmaking products, including glass containers, plate glass, and fiberglass. Non-glass uses include foundry sand, plaster sand, sandblasting sand, stucco sand, silica flour for abrasives and filter sand. Hard rock silica is most often used as a silica source in the manufacture of special types of Portland cement. Small amounts are used in the manufacture of silica brick for refractories and in the manufacture of specialty ceramics.

A marketable silica product can be made from a variety of siliceous raw materials. In California, the majority of silica production comes from Eocene sands of the Ione and Domengine Formations. Historically, silica has been produced from deposits ranging in age from Precambrian to Recent, and in consistency from indurated quartzites to loose sand dunes. Industrial sand and gravel production of 2.6 million tons in 1984 is valued at over $40,000,000.

Currently, glass container manufacturing consumes the largest amount of silica raw materials. These containers are made for California's substantial wine and beer industry. This market is relatively stable, as the wine and beer consumption has stabilized and no major increases are projected. Much of the increase in silica consumption is due to accelerated construction activity, which entails the use of increased amounts of plaster, stucco, and blasting sand, as well as cement.

Demand for industrial sand and gravel is expected to increase very slightly, only 1.5% per year. Increasing competition from plastic containers may shrink the glass container market, which could force smaller operations out of business unless alternative markets are developed.

For further information, please call (916) 445-5716, the DMG centralized information number.

PART I: UNITED STATES AND WORLDWIDE

SAND AND GRAVEL
(Data in thousand short tons, unless noted)

1. UNITED STATES PRODUCTION AND USE

Construction sand and gravel valued at $2.4 billion was produced by 4,300 companies from 5,900 operations in 50 states. Leading states in order of volume were California, Texas, Michigan, Arizona, Ohio, Alaska, New York, Colorado, Illinois, and Minnesota, which accounted for about 52% of the total output. About 44% of this tonnage was used as aggregate in concrete for residential and nonresidential buildings, highways, bridges, dams, waterworks and airports, and other concrete products; 25% in roadbases and coverings; 15% as asphaltic concrete aggregates and other bituminous mixtures; 11% for construction fill; and 5% was for railroad ballast, snow and ice control, and other.

Industrial sand and gravel valued at $390 million was produced by 97 companies from 176 operations in 35 states. Leading states in order of volume were Illinois, Michigan, New Jersey, California, and Texas. Their combined production represented 49% of the national total. About 40% of this tonnage was used as glassmaking sand, 25% as foundry sand, 7% as abrasive sand, 7% as hydraulic fracturing sand, and 21% for other miscellaneous or unspecified uses.

2. SALIENT STATISTICS--UNITED STATES

	1981	1982	1983	1984	1985[e]
Construction sand and gravel:					
Production	[e]690,000	594,000	[e]655,100	773,900	800,000
Imports for consumption	333	185	123	151	150
Exports	1,265	1,128	1,300	1,845	1,900
Consumption, apparent	[e]689,000	593,100	[e]653,900	772,200	800,000
Price: Average value, dollars per ton	[e]2.79	2.82	[e]2.90	2.90	3.00
Stocks, yearend		Not available			
Employment, quarry and mill[e]	46,000	44,000	45,000	46,000	46,000
Net import reliance[1] as a percent of apparent consumption		Net exporter			

---

e Estimated. NA Not available.

1 Defined as imports - exports + adjustments for Government and industry stock changes.

2. SALIENT STATISTICS--UNITED STATES (Continued)

	1981	1982	1983	1984	1985[e]
Industrial sand and gravel:					
Production	29,980	27,400	26,620	29,380	29,000
Imports for consumption	4	90	58	26	30
Exports	1,132	818	1,047	1,193	1,000
Consumption, apparent	28,900	26,700	25,600	28,200	28,900
Price: Average value, dollars per ton	11.08	11.82	12.59	12.84	12.90
Stocks, yearend		Not available			
Employment, quarry and mill[e]	1,600	1,500	1,500	1,600	1,600
Net import reliance [1] as a percent of apparent consumption		Net exporter			

3. RECYCLING

Asphalt road surfaces and cement concrete surfaces were recycled on a limited but increasing basis.

4. IMPORT SOURCES (1981-84)

Construction sand and gravel: Canada 83%, Other 17%.
Industrial sand and gravel: Australia 72%, Bahamas 10%, Canada 10%, Other 19%.

5. TARIFF

Item	Number	Most Favored Nation (MFN) 1/1/85	Most Favored Nation (MFN) 1/1/87	Non-MFN 1/1/85
95% or more silica and not more than 0.6% iron oxide	513.11	$0.06/lt	Free	$2.00/lt
Other	513.14	Free	Free	Free

6. DEPLETION ALLOWANCE

(Domestic and Foreign)
Sand and Gravel: Common varieties 5%, industrial sand or pebbles 14%.

7. GOVERNMENT STOCKPILE

None.

---

e Estimated.
1 Defined as imports - exports + adjustments for Government and industry stock changes.

8. EVENTS, TRENDS, AND ISSUES

Construction sand and gravel output increased slightly in 1985. It is estimated that 1986 domestic production and U.S. apparent consumption will be about 810 million tons each. From a 1984 base, demand for construction sand and gravel is expected to increase at an average annual rate of 2.5% through 1990, giving a probable forecast demand in 1990 of about 900 million tons.

Industrial sand and gravel output increased in 1985 by about 2%. It is estimated that 1986 domestic production and U.S. apparent consumption will be 30 million and 29 million tons, respectively. From a 1983 base, demand for industrial sand and gravel is expected to increase at an average annual rate of 2.2% through 1990, giving a probable forecast demand in 1990 of about 33 million tons.

The sand and gravel industry continued to be concerned with safety regulations and environmental restrictions in 1985. Shortages in urban and industrialized areas were expected to continue to increase due to local zoning regulations and land development alternatives. This was expected to continue to cause a movement of sand and gravel operations from high population centers.

9. WORLD MINE PRODUCTION AND RESERVE BASE

	Mine Production[e]		Reserve Base[1]
	1984	1985	
United States	803,280	830,000	The reserve base is controlled largely by land use and/or environmental constraints. Local shortages of sand or gravel are common.
Other countries	NA	NA	

---

e Estimated.

1 The "reserve base" is that part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices, including those for grade, quality, thickness, and depth. The reserve base is the in-place demonstrated (measured plus indicated) resource from which reserves are estimated. It may encompass those parts of the resources that have a reasonable potential for becoming economically available within planning horizons beyond those that assume proven technology and current economics. The reserve base includes those resources that are currently economic (reserves), marginally economic (marginal reserves), and some of those that are currently subeconomic (subeconomic resources). The term "geologic reserve" has been applied by others generally to the "reserve-base category, but it also may include the inferred-reserve-base category; it is not a part of this classification system.

10. WORLD RESOURCES

Sand and gravel resources of the world are large. However, due to their geographic distribution, environmental restrictions, and quality requirements for some uses, their extraction is sometimes uneconomic. The most important commercial sources of sand and gravel have been river flood plain, river channel, and glacial deposits. Marine deposits could become important in the future. Quartz-rich sand and sandstones, the main source of industrial silica sand, occur throughout the world.

11. SUBSTITUTES

Crushed stone remains the predominant alternative for construction aggregate use. Silica sand continues to be the major material used for glassmaking and for foundry and molding sands; alternates are zircon, olivine, staurolite, and chromite sands.

PART II: CALIFORNIA

12. CALIFORNIA GEOLOGICAL OCCURRENCES

Silica raw materials can be produced from a variety of geologic units. Some of the highest quality silica sands in California are mined from sedimentary sandstones of early Tertiary (Paleocene and Eocene) age. These deposits consist essentially of quartz and clay, with a low percentage of feldspar and very small portions of heavy minerals. This material must be beneficiated to remove clay and iron-bearing minerals if the product is used for glassmaking. The presence of iron minerals will discolor glass. Formations that have been or are current sources of silica include, the Ione Formation in Amador County, the Domengine Formation in Contra Costa County, the Tesla Formation in Alameda County, the Tejon Formation in San Diego County, the Silverado Formation in Orange and Riverside counties and the Santiago Formation in Orange County. The younger (upper Miocene to Pliocene) Santa Margarita Sandstone in Santa Cruz County is also a source of silica sand although the material is primarily used for aggregates.

The second most important source of silica sand in California is Pleistocene to Recent beach sands and sand dunes. These sands, in general, contain a lower proportion of quartz, and a higher proportion of feldspar and heavy minerals than Tertiary sands and sandstone. Beach sands are used for applications that do not require clean, high grade quartz sands such as sandblasting, foundry and stucco sand. Most of the beach and dune sand mined in California is obtained from Monterey County, although beach sands have been mined in San Francisco, San Luis Obispo and Los Angeles counties.

Aside from sand, quartz and quartzite have been mined for silica brick, ceramics, cement manufacture, silica flour and other specialty products. The most important of these are the Carboniferous(?) Oro Grande Series quartzite in San Bernardino County and Ordovician Eureka quartzite in Inyo County. These quatzites are extremely clean and average 98% quartz.

Cretaceous vein quartz and Tertiary quartz gravels in the western foothills of the Sierra Nevada and Cretaceous quartz pegmatites in San Diego and Riverside counties have been locally mined as a source of silica. Usually, these operations have been small and restricted to local demands for specialty products such as chicken grit, flux material for steel furnaces and silica flour. One deposit still active is a small specialty sand and gravel operation in Placer County. Here quartz sand and gravel deposited as a result of hydraulic mining for gold is mined as a source of silica.

There are most likely other deposits similar to those described above and even others that may not be geologically similar that could be used as a silica source. As with certain types of clay, the value of siliceous raw material lies with the finished product. Given new products or uses, other geologic formations could prove to be important sources of silica.

13. CALIFORNIA LOCALITIES

SAND AND SANDSTONE-NORTHERN CALIFORNIA

Alameda County-

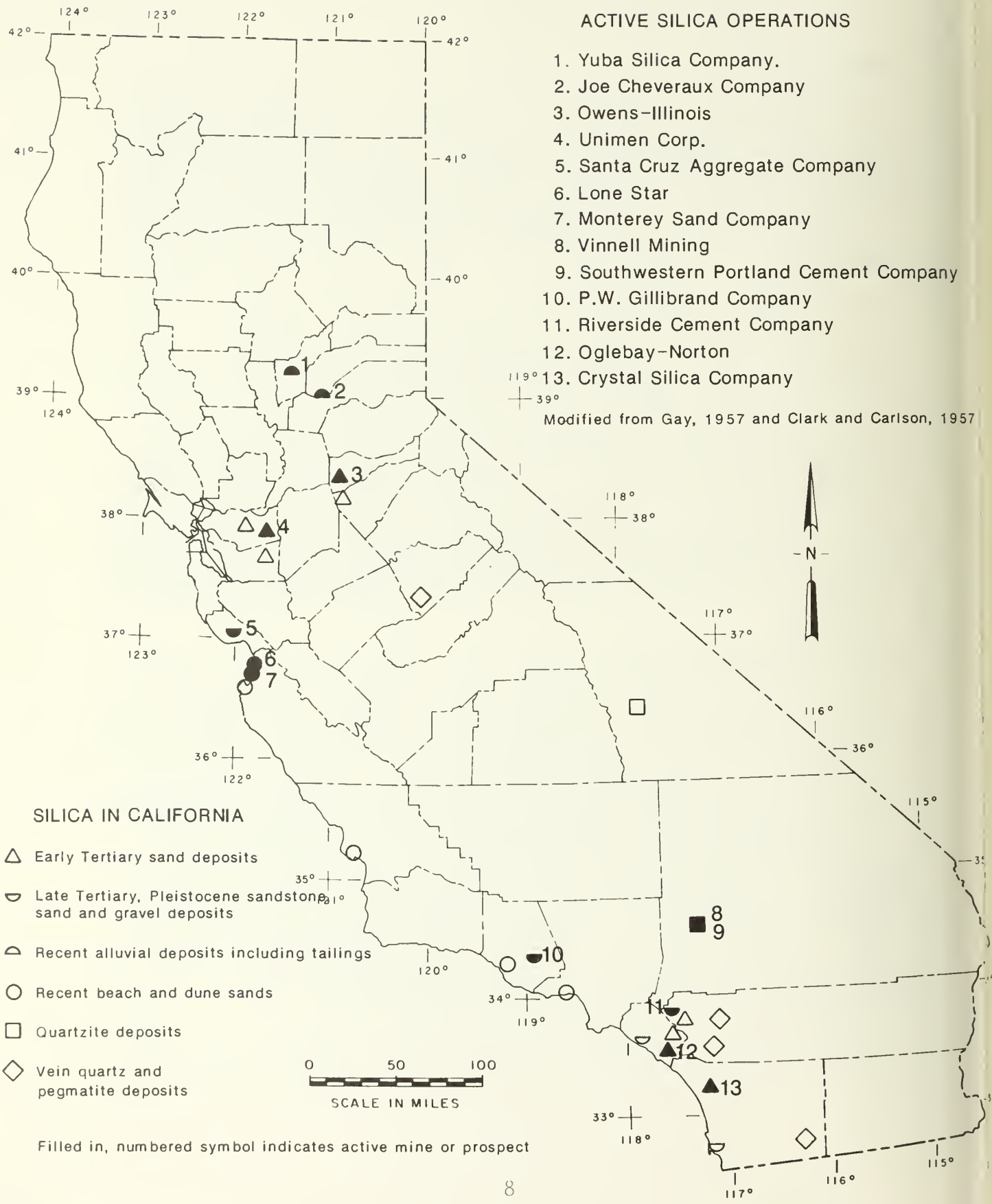
In the early 1950s, small amounts of naturally bonded foundry sand were mined from the Eocene Tesla Formation approximately 3-4 miles southeast of Livermore. Production was limited due to the availability of higher quality material mined from the Domengine Formation near Mount Diablo. The Tesla Formation is exposed as a 5 mile westward trending band south of Livermore. The lithology is similar to that of the Ione Formation, but limited exposure and the thinness of the sand unit limits potential development.

Amador County-

Amador County leads all other counties in California in silica production. Sand is mined from the Eocene Ione Formation just south of the town of Ione by Owens-Illinois. This material is used exclusively for the manufacture of flat glass, glass containers and other glass products. The deposit is composed of quartz sand and clay in about a 60-40 mix. Small amounts of heavy minerals and rock fragments are also present. The Ione Formation is intermittently exposed from Oroville in Butte County in the north to Knights Ferry in Stanislaus County in the south. In addition to the Owens-Illinois deposit, an old Interpace (now North American Refractories) sand pit area southeast of Owen's pit still has mineable reserves. Since the Ione Formation is relatively clay-rich elsewhere, it is unlikely that other economic deposits of sand will be discovered.

Contra Costa County-

Silica production in Contra Costa County has come from the middle Eocene Domengine Formation near Mount Diablo and near Brentwood. Sandstone beds of the Domengine Formation crop out northeast of Mount Diablo in a milewide belt extending from Concord to Byron, a distance of 20 miles. Silica sands have been mined from a white sandstone member that ranges in thickness from 75 to 400 feet. The sandstone is massive, unconsolidated, containing angular, well-sorted grains of 80-90% quartz and 10-20% feldspar. Sandstone units of the Domengine also crop out in Solano County near American Canyon, but these units have not been evaluated as a possible source of silica. Glass and foundry sands have been produced from the Domengine in the Nortonville-Somersville area, approximately 6 miles southwest of Antioch. The silica was mined underground from beds encountered in coal mining. Currently, large amounts of glass sand are mined near Byron, by Unimen Corporation (formerly Martin-Marietta).


ACTIVE SILICA OPERATIONS
1. Yuba Silica Company.
2. Joe Cheveraux Company
3. Owens-Illinois
4. Unimen Corp.
5. Santa Cruz Aggregate Company
6. Lone Star
7. Monterey Sand Company
8. Vinnell Mining
9. Southwestern Portland Cement Company
10. P.W. Gillibrand Company
11. Riverside Cement Company
12. Oglebay-Norton
13. Crystal Silica Company
Modified from Gay, 1957 and Clark and Carlson, 1957
SILICA IN CALIFORNIA
Early Tertiary sand deposits
Late Tertiary, Pleistocene sandstone, sand and gravel deposits
Recent alluvial deposits including tailings
Recent beach and dune sands
Quartzite deposits
Vein quartz and pegmatite deposits
0 50 100
SCALE IN MILES
Filled in, numbered symbol indicates active mine or prospect
N

Monterey County-

Most of the beach and dune sand that is mined in California for silica is obtained from Monterey County. Currently, two companies, Lone Star and Monterey Sand, remove sand from unconsolidated Recent beach and dune sands that extend along the east shore of Monterey Bay, from Sand City to a few miles north of Marina. The sand is rather coarse grained and characterized by high percentages of feldspar and iron-staining. Mined material is used for foundry sand, sandblasting sand, plaster sand and other industrial applications. Glass sand is not produced.

Until the early 1970s glass sand was produced from unconsolidated Recent dune sands on the Monterey peninsula near Pacific Grove. Most of the sand in this area is unusually white and clay-free and contains about 53% quartz, 46.5% feldspar and 0.5% heavy minerals. In addition to glass sand, foundry sand and silica flour were produced from this area until urbanization pressure forced the termination of mining operations.

Santa Cruz County-

Glass container and fiberglass sand is mined from the Miocene Santa Margarita Sandstone east of Felton, Santa Cruz County. The Santa Margarita Sandstone is mined primarily for aggregate; only the Santa Cruz Aggregate Company currently markets a glass sand product. The sandstone beds consist of fine to medium grained, arkosic, yellowish-white sand. This sand is composed of 60-70% quartz, 25-35% feldspar, with varying amounts of rock fragments and heavy minerals.

SAND AND SANDSTONE-SOUTHERN CALIFORNIA

Los Angeles County-

Sandblasting, engine and foundry sand has been produced from unconsolidated, highly feldspathic dune sand that extends about 10 miles along Santa Monica Bay between Playa del Rey and Palos Verdes Hills, and about 2 miles inland. Naturally bonded foundry sand was mined from alluvium at Elysian Park and near Torrance. There are no silica producers operating in Los Angeles County at this time.

Orange County-

Specialty sands have been produced from three areas in Orange County. The first is currently mined by Oglebay-Norton for glass container sand and is located south of San Juan Creek near San Juan Capistrano. Sand is extracted from the Eocene Santiago Formation. The medium grained sandstone consists of nearly equal percentages of quartz and feldspar with as much as 20% clay. Similar sands crop out for several miles both north and south of this deposit, but these areas have not been developed.

The Trabuco Canyon area of Orange County is another past producer of specialty sands. This deposit occurs in the Paleocene Silverado Formation, which is lithologically similar to the Ione Formation. Quartz sand was produced as a byproduct of clay mining and sold when the clay market declined.

Naturally bonded molding sand was produced from marine terrace deposits of Pleistocene age in the bluffs east of Newport Bay. The sand is fine grained and contains a high percentage of clay. The mine was active from about 1942 to 1950.

Riverside County-

Specialty sand deposits in Riverside County are located near Corona. One deposit, currently mined by Riverside Cement Company for use in the manufacture of white Portland cement, is located about 4 miles southeast of Corona. The deposit is composed of white sandstone of probable Pliocene age, consisting of quartz and feldspar. This deposit has been mined intermittantly since the 1920s.

At least five other deposits occur near Corona. The most important of these is located 6 miles southeast of Corona on the west side of Temescal Wash. This and the other deposits are located in the lower part of the Paleocene Silverado Formation. The sand is quartzose, with minor feldspar and distinctive biotite. Approximately 35% of the main orebody is clay, which was removed and sold. The mined sands were used for flint and container glass manufacture. Originally developed in the 1920s, this property is now idle. The other deposits in the Corona area are small and have not been mined or have had only limited production.

San Diego County-

The Crystal Silica Company currently produces large amounts of sand from the Torrey sand member of the Eocene La Jolla Formation. Approximately one-half of the sand produced is used in construction and the other half is used in the manufacture of glass containers. Mineable material consists of 65% quartz, 15% feldspar, 20% clay and silt and a very minor amount of heavy minerals. The sand of the La Jolla Formation is exposed in a belt that extends northward from the Soledad Valley near Del Mar, to a point beyond the boundary between San Diego and Orange counties, although sand is currently mined only by Crystal Silica.

Before 1952, naturally bonded molding sand was mined from a deposit of Pliocene sandstone in the city of San Diego. In addition, undeveloped deposits of beach sands along the coast and dune sands along the southeast shore of Clark Dry Lake are possible future sources of silica.

San Louis Obispo County-

Unconsolidated sand dunes extend for several miles along the shore south of Pismo Beach and as much as one mile inland. These sands are fine grained and highly feldspathic. Clay-free foundry sand, engine, and sandblasting sand for local markets has been produced from this area. No producers are currently active in the area.

Ventura County-

The P.W. Gillibrand Company extracts silica sand from the Pliocene-Pleistocene Saugus Formation, 5 miles north of Santa Susana in

Ventura County. This unit is normally mined for use as Portland cement concrete aggregate. This formation is a typical deltaic deposit consisting of conglomerate, sandstone and siltstone. The deposit mined by Gillibrand is composed largely of quartz, with up to 35% feldspar. Approximately 60% of the silica sand produced is used for glass container sand, while the remainder is used in a variety of specialty products, such as stucco and backing sand.

Small amounts of molding sand have been mined from Late Tertiary and Pleistocene sandstones in Santa Barbara County near Lompoc and Goleta, and in San Mateo County west of Millbrae. In addition, Recent alluvial deposits have been mined for foundry sand in San Francisco County in the Mission District and in Sacramento County in North Sacramento. Recent beach deposits have also yielded foundry sand and other specialty products at San Francisco Beach in San Francisco. Other deposits mined primarily for aggregate may have produced small amounts of specialty sand.

QUARTZITE

Inyo County-

Large tonnages of nearly pure quartzite are contained in the Ordovician Eureka Quartzite, which is extensively exposed in Inyo County and through a large part of Nevada County. In Inyo County this formation is generally 200 to 400 feet thick and forms gently to steeply dipping bodies hundreds to thousands of feet long. The Eureka Quartzite is prominently exposed in the Inyo Mountains, the Panamint Range and in the Funeral Mountains. Most of these areas are of difficult accessability, however, and only on the low western slope of the Inyo Mountains and along the east margin of the Owens Valley, has the Eureka Quartzite been mined commercially. The mining areas are located about 2 1/2 miles northwest of Keeler and approximately 4 miles further northwest. The mined material was relatively pure and used in the manufacture of silica brick. There is no current production from this area.

San Bernardino County-

The Oro Grande area of San Bernardino County has been the principle source of quartzite in California. The Oro Grande area is located in western San Bernardino County east of the town of Oro Grande and north of Victorville. Massively bedded quartzite of the Carboniferous? Oro Grande and Hodge Series occurs in extensive bodies as much as 250 feet thick and several thousand feet long. The silica content of the mined material typically ranges from 98.5% to 99.1%. Today, two companies, Vinnell Mining and Southwestern Portland Cement, are active in the area. The quartzite is used as an additive for specialty cement and for the manufacture of cement pipe. The quartzite has also been used in the manufacture of silica brick.

Miscellaneous Localities

Quartzite occurs throughout California and usable quartzite may be discovered in other parts of California if the demand for silica sharply

increases. Most of the potentially usable quartzite is in southern California. In the Great Basin and Mojave Desert, several pure quartzite formations are widespread. The late Precambrian Sterling Quartzite crops out over a large portion of Death Valley as does the Early Cambrian Zabriskie Quartzite. Also, the Early Cambrian Harkless Formation in the Inyo Mountains contains large exposures of thick, pure quartzite. Quartzite also occurs in the Klamath Mountains, the Coast Ranges, the Sierra Nevada and in the Peninsular Ranges.

VEIN QUARTZ AND QUARTZ GRAVELS

Mariposa County-

The principle source of vein quartz in northern California has been at White Rock in western Mariposa County. A massive vein of white "bull" quartz was mined by Kaiser Aluminum from 1942-1952. The material was used to produce ferrosilicon.

Placer County-

A unique deposit of quartz gravel is located at Lake Bombie, located along the border of Placer and Nevada counties, approximately 10 miles north of Auburn. This deposit is the result of hydraulic gold mining in which vast quantities of quartzose Tertiary sand and gravel flowed into streams draining into the Bear River. Specialty sand and gravel has been mined from this area since 1946 by the Joe Cheveraux Company, which is currently active. Over 20 kinds of specialty products have been marketed from this deposit. Products include filter sand, plaster sand, refractory sand, golf-course sand, and a number of other products.

Quartz gravel has also been mined in the George, Alta, and Dutch Flat areas of Placer County during the 1920s. This material was used for steel flux, abrasives, and stucco sand.

Riverside and San Diego Counties-

Pegmatite quartz has been mined chiefly in the Peninsular Ranges of San Diego and Riverside Counties. The quartz has been produced intermittently, largely as a by-product of feldspar production. The largest operation was near Murrieta, Riverside County during the 1920s and 1930s. Other deposits were mined near Nuevo and Winchester, Riverside County, and west of Jacumba and north of Live Oak Spring, San Diego County. The quartz mined from these deposits was used for abrasives and ceramics. Other areas from which quartz has been mined are south of Hemet, south of Lakeview, and near Perris, Riverside County and the Descanso, Warner Hot Springs, and Compo areas of San Diego County.

Yuba County-

A proposed silica operation east of Marysville will crush quartz cobbles separated from the tailings of the gold dredge to make silica products. The newly formed Yuba Silica Company will build a 300,000 ton per year plant in late 1985. Anticipated products will be glass sand and silica flour.

Miscellaneous Foothill Locations-

Small amounts of vein quartz have been produced at Coulterville and the Harvard gold mine in Tuolumne County, at White Rock Canyon in El Dorado County, near Friant in Fresno County, west of Patterson in Stanislaus County and near Redding in Shasta County.

14. CALIFORNIA PRODUCTION

There are ten companies that currently produce silica sand and two companies that mine quartzite. Preliminary figures for industrial sand and gravel production in California for 1984 are 2,630,000 tons worth $40,750,000. These figures are approximately 20% higher than 1983 production. Roughly 80% of the silica produced in California is used in the manufacture of glass products.

15. UTILIZATION AND MARKETS

The physical and chemical properties of silica raw materials usually determine what the material can be used for. Glass sand is selected for its chemical composition. Most of the common grades of glass require sand with a maximum of silica and a minimum of iron. Up to 50% feldspar is acceptable for certain types of glass. Generally, 'amber' glass sand, use in colored glass containers (beer bottles), may contain from 0.05% to 0.10% iron. 'Flint' glass sand may contain no more than 0.04% iron and is required for all colorless glass, clear containers and plate glass.

Approximately 80% of the silica produced in California is used in the manufacture of flat glass, glass containers, and fiberglass almost exclusively for California markets. The biggest consumer of container glass is the California wine industry. There are 16 glass manufacturing plants in California of which only one produces clear glass. The other 15 produce glass containers of fiberglass. A small amount of high quality glass sand (about 10%) is brought in to southern California glass plants.

The remaining 20% of silica produced is used for a wide variety of products including blasting sand, stucco and plaster sand, foundry sand, filter sand, abrasives, and silica flour. One company produces silica exclusively as an additive for the manufacture of a specialty white cement. Quartzite mined in California is used in specialty pipe manufacture and oil well cementing, and is crushed for silica flour.

16. MINING METHODS AND BENEFICIATION

Silica sand deposits are usually very soft and can be mined with conventional open pit equipment. Draglines and dredges are used in softer deposits, while bulldozers and scrapers may be used in other deposits. In harder deposits, such as quartzite quarries, blasting may be required to loosen the material.

Mined material is usually screened and washed, although some producers only dry screen. Generally, the sand material is processed by some combination of screening, washing and drying, and is then screened again into marketable splits. Occasionally these splits are blended into products depending on demand. Glass sand may have to be ground to a specific size to insure even melting. In addition, some glass-sand producers have to separate sand from clay by flotation and also may use a magnetic separator to remove heavy minerals. Quartzite is typically blasted from consolidated deposits, washed, crushed, and then ground to useable size.

17. CALIFORNIA EVENTS, TRENDS AND ISSUES

Glass sand demand is dependent primarily upon the wine and beer industry in California. The wine industry is currently in a steady state mode with little expansion occurring (stable market). The glass market faces increasing pressure as plastic containers gain an ever increasing share of the container market. High quality silica sand is imported from Nevada and could be replaced by a local source. Significant increases in production will most likely result from increasing construction, which will require specialty sands. New markets need to be developed before any long term increase in silica production can occur.

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